MULTIMEDIA UNIVERSITY

STUDENT IDENTIFICATION NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2022/2023 (TERM ID 2210)

BDS2074 – MANAGEMENT DECISION SCIENCE

(All Sections/Groups)

14 FEBRUARY 2023
9.00 a.m. – 11.00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of **4** printed pages excluding the cover page, with **4** questions only.

2. Attempt **ALL FOUR (4)** questions.

3. Students are allowed to use non-programmable scientific calculators (without restriction).

4. Please write all your answers in the Answer Booklet provided. All necessary workings **MUST** be shown.

5. Normal distribution table is attached at the end of this question paper.

QUESTION 1 [Total = 25 marks]

a) Leaf Company sells three types of books X, Y and Z. Books X, Y and Z are sold for RM7, RM5 and RM12 respectively. A sales person takes 10 minutes to sell a book X, 15 minutes to sell a book Y and 12 minutes to sell a book Z. The delivery cost for book X is RM1 each, for book Y is RM0.50 each and book Z is RM0.80 each. During a week, a sales person is only allowed to spend on delivery not more than RM75. The selling time is restricted to only 30 hours per week. The unit costs of X, Y and Z are RM3, RM2 and RM4 respectively. The company wishes to maximize its weekly profit.

(i) Formulate the problem above as a Linear Programming Model. [4 marks]

(ii) Set up the initial simplex tableau by including the necessary slack variables. [Do not solve until the final simplex table] [6 marks]

b) A tourism company has a van at each of four depots (D1, D2, D3 and D4). Tourists staying in four hotels (H1, H2, H3 and H4) require a van each. The distance (in kilometres) between the depots and the hotels are given in the following table:

Hotel	Depot			
	D1	D2	D3	D4
H1	28	22	11	15
H2	12	16	8	8
H3	24	15	15	19
H4	17	8	14	21

Using Hungarian method, how should the vans be assigned to the customers to minimize the total distance travelled? What is the minimum total distance travelled?

[15 marks]

Continued...

QUESTION 2 [Total = 25 marks]

The table below shows the unit cost, in RM, of transporting goods from each of three warehouses A, B and C to each of three supermarkets X, Y and Z. It also shows the stock at each warehouse and the demand at each supermarket.

To / From	Supermarket X	Supermarket Y	Supermarket Z	Stock
Warehouse A	24	22	28	13
Warehouse B	26	26	14	11
Warehouse C	20	22	20	12
Demand	10	13	13	

a) Find the initial feasible solution using Northwest Corner method and the associated initial total shipping cost. [7 marks]

b) Find the optimal transportation schedule and cost using Stepping Stone method. [18 marks]

QUESTION 3 [Total = 25 marks]

Johan has a farming project which consists of six activities. The activities that must be accomplished are listed as follows:

Activity	Weeks			Immediate Predecessors
	Optimistic time, a	Most likely time,m	Pessimistic time, b	
A	8	9	10	-
B	5	7	9	A
C	6	10	14	B
D	5	6	7	A
E	7	9	11	B, D
F	1	2	3	C, E

a) Construct a network diagram for this problem. [6 marks]

b) Determine the expected time, variance, ES, EF, LS, LF and slack for each activity. [9 marks]

c) Determine the critical path to complete the farming project. [2 marks]

d) Calculate the variance and the expected completion time of the farming project. [5 marks]

e) What is the probability that the farming project can be completed by 27 weeks? [3 marks]

Continued...

QUESTION 4 [Total = 25 marks]

Halim Construction is considering several development projects. The financial success of these projects depends on market conditions. The projects and financial returns (in RM millions) under the market conditions are shown in the table below:

Project	Market, Returns (RM in millions)		
	Good Market	Average Market	Poor Market
Factory	45	12	6
Motel	25	19	13
Shop	4	15	35
Supermarket	10	15	17

a) Determine the best investment using the following decision criteria:

(i) Maximax [3 marks]

(ii) Maximin [3 marks]

(iii) Equally likely criterion [4 marks]

(iv) Criterion of realism, using $\alpha = 0.6$ [4 marks]

(v) Minimax regret criterion [5 marks]

b) For the data in part a), the probabilities of good market, average market and poor market are 0.4, 0.5 and 0.1 respectively.

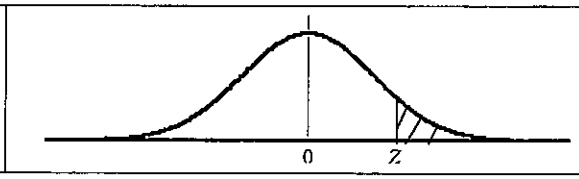
(i) Construct an expected opportunity loss (EOL) table. [4 marks]

(ii) Using minimum EOL as the decision criterion, determine the best project. What is the minimum EOL? [2 marks]

End of question.

APPENDIX:

Table 1
The Upper Tail Area Under the Standard Normal Curve



Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641
0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247
0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859
0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483
0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121
0.5	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776
0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451
0.7	0.2420	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148
0.8	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867
0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611
1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379
1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170
1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985
1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823
1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681
1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559
1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455
1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367
1.8	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294
1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233
2.0	0.0228	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197	0.0192	0.0188	0.0183
2.1	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146	0.0143
2.2	0.0139	0.0136	0.0132	0.0129	0.0125	0.0122	0.0119	0.0116	0.0113	0.0110
2.3	0.0107	0.0104	0.0102	0.0099	0.0096	0.0094	0.0091	0.0089	0.0087	0.0084
2.4	0.0082	0.0080	0.0078	0.0075	0.0073	0.0071	0.0069	0.0068	0.0066	0.0064
2.5	0.0062	0.0060	0.0059	0.0057	0.0055	0.0054	0.0052	0.0051	0.0049	0.0048
2.6	0.0047	0.0045	0.0044	0.0043	0.0041	0.0040	0.0039	0.0038	0.0037	0.0036
2.7	0.0035	0.0034	0.0033	0.0032	0.0031	0.0030	0.0029	0.0028	0.0027	0.0026
2.8	0.0026	0.0025	0.0024	0.0023	0.0023	0.0022	0.0021	0.0021	0.0020	0.0019
2.9	0.0019	0.0018	0.0018	0.0017	0.0016	0.0016	0.0015	0.0015	0.0014	0.0014
3.0	0.0013	0.0013	0.0013	0.0012	0.0012	0.0011	0.0011	0.0011	0.0010	0.0010
3.1	0.0010	0.0009	0.0009	0.0009	0.0008	0.0008	0.0008	0.0008	0.0007	0.0007
3.2	0.0007	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006	0.0005	0.0005	0.0005
3.3	0.0005	0.0005	0.0005	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0003
3.4	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0002
3.5	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
3.6	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
3.7	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
3.8	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
3.9	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

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